CBS

CBS Inc., 1800 M Street, N.W.
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Re: MM Docket No. 87-268

Dear Ms. Searcy: November 30, 1988

Enclosed are an original and nine copies of the Comments of CBS Inc. in response to the Commission's September 1, 1988 Tentative Decision and Further Notice of Inquiry in the above proceeding, in which the Commission is considering issues related to advanced television systems and their impact on the existing broadcast service .

Please direct any questions to the undersigned.

Yours truly,

Mark W. Johnson
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Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact on the Existing	)	
Broadcast Service	)	
	)	
Review of Technical and	)	
Operational Requirements:	)	MM Docket No. 87-268
Part 73-E, Television Broadcast	)	
Stations	)	
	)	
Reevaluation of the UHF Television	)	
Channel and Distance Separation	)	
Requirements of Part 73 of the	)	
Commission's Rules	)	

COMMENTS OF CBS INC.

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November 30, 1988

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SUMMARY OF COMMENTS OF CBS INC.

CBS strongly supports the Commission's tentative findings that "terrestrial broadcast use of ATV techniques would benefit the public," and that "the benefits of this technology can be realized by the public most quickly if existing broadcasters are permitted to implement ATV." CBS also supports the finding that service to NTSC receivers must be continued -- through either simulcasting or ATV/NTSC signal-compatible ATV transmissions -- during the transition period to ATV. These findings demonstrate the Commission's commitment to the advancement of free over-the-air broadcasting and to a regulatory framework for terrestrial broadcast ATV service.

The preliminary data give reason to hope that, if sufficient attention is given to UHF taboos and to improving NTSC receivers, supplemental VHF/UHF spectrum can be found for every existing licensee to implement a high-quality ATV service, but that result depends on several assumptions which are the subject of further study. It is premature to eliminate the 1-13 GHz band from consideration at this time, since the full spectrum requirements of a competitive ATV system are not yet known and the Advisory Committee has recommended keeping this spectrum option open. Even if 1-13 GHz spectrum is not ultimately needed for primary ATV transmissions, it may well be

needed for adjunct broadcast services such as translators and relay services.

The Commission's range of tentative ATV allocation options -- from no additional spectrum to 6 MHz of additional spectrum per licensee -- presents a useful framework for considering the trade-offs that must be faced in making allocations decisions. Those decisions should be based on testing and further research, which should be expedited and completed as soon as possible. In that regard, the Advanced Television Test Center has scheduled propagation tests in the VHF and UHF bands, as well as at 2.5 and 12 GHz, and is preparing to test proponent ATV systems as soon as complete systems are ready for testing. The Commission staff and the Advisory Committee have done some research on UHF/VHF spectrum availability. More work has to be done, and is being done, to supplement that data and to consider the special problems of ATV implementation in the largest television markets.

The Commission should focus on spectrum allocation alternatives that will not require any "repacking." Unless it becomes clear that each local over-the-air broadcast station will not be able, for technical reasons, to remain on its present channel and share equally in new spectrum allocated for terrestrial

ATV broadcasting, the Commission should not consider any limited channel "adjustments" to present service.

The NTSC standard should not be relaxed at this time, and the Commission should not adopt a new waiver procedure to allow ad hoc introduction of broadcast ATV service or changes in NTSC transmissions. Such a procedure is unnecessary and would complicate ATV implementation.

A single terrestrial ATV broadcast transmission standard should be adopted by the Commission based on the consensus of affected industries. If consensus does not develop, the Commission should not be reluctant to select a standard based on the results of the testing program and then-available allocation options. "Open architecture" receivers are an inadequate substitute for a single standard because of their cost, complexity and inherent limitations.

During the transition to ATV, it is essential that NTSC service continue unimpaired. It should be emphasized that this result can be achieved either through an NTSC-based ATV transmission system or, perhaps most feasibly, through simulcasting of a stand-alone ATV signal.

It would also be in the public interest for the various media (broadcast, cable, DBS) to employ the ATV transmission standards that are conveniently interoperable, so that ATV service is introduced rapidly and at the lowest possible cost to the consumer.

CBS agrees with the Commission's initial view that it has the legal authority, and that it would be sound policy, to grant additional spectrum to incumbent licensees. Any additional spectrum -- whether for NTSC-based ATV transmissions or stand-alone ATV simulcasting -- should be considered an integral part of a licensee's frequency assignment. It is in the public interest to allow television licensees to improve the technical quality of their free over-the-air transmissions to a competitive level. The uncertainties, costs and delays inherent in comparative proceedings would inevitably frustrate this public interest goal.

Finally, the Commission should defer decisions on allotment methodology and flexible use issues until more is known about the need for, and availability of, additional spectrum to permit ATV broadcasting.

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In the Matter of	)	
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Advanced Television Systems and Their Impact on the Existing Broadcast Service	)	
	)	
Review of Technical and Operational Requirements: Part 73-E, Television Broadcast Stations	)	MM Docket No. 87-268
	)	
Reevaluation of the UHF Television Channel and Distance Separation Requirements of Part 73 of the Commission's Rules	)	

COMMENTS OF CBS INC.

CBS Inc., by its attorneys, hereby submits its comments on the Commission's Tentative Decision and Further Notice of Inquiry in the above-captioned docket (FCC 88-288, released September 1, 1988) ("Further Notice").

I. INTRODUCTION

In July 1987, the Commission initiated this "wide-ranging inquiry to consider the technical and public policy issues surrounding the use of advanced television technologies by television broadcast licensees."*

* Advanced Television Systems, Notice of Inquiry, MM Docket No. 87-268, 2 FCC Rcd 5125 (1987) ("NOI").

This inquiry has directly resulted in the establishment of the Advisory Committee on Advanced Television Service, in which CBS has been actively involved,* and which has already developed and collated a great deal of information on various technical and economic issues involved in the implementation of Advanced Television ("ATV")** service by terrestrial broadcasters.***

Further, as discussed in more detail infra, the Advanced Television Test Center ("ATTC") has been established for the purpose of testing candidate ATV transmission systems**** and the Advanced Television Systems Committee ("ATSC") will be

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* CBS's President and Chief Executive Officer, Laurence A. Tisch, is a member of the Advisory Committee, and Joseph Flaherty, Vice President and General Manager, Engineering and Development, is Chairman of the Subcommittee on Planning. FCC News, Ref. No. 142, October 9, 1987. Other CBS employees are active in various Working Parties of the Advisory Committee.

** In these Comments, CBS will observe the distinction between ATV and HDTV that the Commission draws in the Further Notice. That is, the term "HDTV" will be used to describe a production or transmission system that approaches the image quality of 35mm film. "ATV" describes "any system that results in improved television audio and video quality, whether the methods employed improve the existing NTSC transmission system or constitute an entirely new system." Further Notice, p. 4, fn. 1.

*** Interim Report of the FCC Advisory Committee on Advanced Television Service, June 16, 1988 ("Interim Report").

**** The ATTC has formed a working relationship with the Cable Television Laboratories, Inc. ("Cable Labs"), which was recently formed by various cable television interests to engage in research and development on technological issues involving that industry. 53 Fed. Reg. 34593 (September 7, 1988). For example, the ATTC and Cable Labs are jointly developing a psychophysical testing plan for use by both organizations.

assessing ATV transmission standards. Also, proponents of various ATV transmission systems have continued to develop their systems, and new systems continue to be proposed. Finally, there has been mounting recognition in Congress and in the Executive Branch that expeditious introduction of ATV terrestrial broadcasting is in the public interest.

All of the constructive activity, technological advancement and broadened interest in ATV in the past year bodes well for the prospect of continued progress and timely development of a high-quality terrestrial broadcast transmission system.

However, as CBS stated in comments on the Advisory Committee's Interim Report:

> "We do not yet know which proponent systems will, in fact, be successfully developed into fully operational systems; we do not know the propagation characteristics of single or multiple-channel HDTV systems; we do not yet know whether sufficient spectrum is or will be available to permit the timely introduction of multiple-channel HDTV systems; and we do not yet know the reaction of consumers and viewers to HDTV systems of differing quality and cost. Precisely because of these uncertainties, it is important that goals be defined, that options be identified and that the work needed to evaluate those options and to achieve those goals be planned and scheduled."*

* Separate Statement of CBS Inc. on the Interim Report of the FCC Advisory Committee on Advanced Television Service, p. 1.

CBS characterized the Interim Report as "an important first step in that direction."* CBS believes that this proceeding is an important further step. The NOI has been successful in generating ATV-related activity and interest, and it is now time to "begin the process of narrowing the issues related to the introduction of terrestrial ATV broadcast service."**

This shift from an open-ended inquiry to a focus on "tentative findings" will help to focus the coming work of the Advisory Committee, the ATTC, the ATSC, system proponents and other interested parties. This in turn will give needed shape and substance to the next phase of the Commission's deliberations. Much of the objective and subjective analysis and testing that must underlie final decisions -- especially in the area of spectrum allocations -- is now under way, and the Commission must be willing to refine its "tentative" views as analysis and testing are completed and as more information becomes available.

Perhaps the most important contribution of the Further Notice to the maintenance of the momentum that has been generated

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* Separate Statement of CBS Inc. on the Interim Report of the FCC Advisory Committee on Advanced Television Service, p. 1.

** Further Notice, ¶4.

toward successful introduction of a terrestrial ATV broadcast system in this country is its message that the Commission is committed to an active role in making the necessary spectrum available and in the development of ATV transmission standards.*

In that regard, the Commission quite correctly concludes "that providing for terrestrial broadcast use of ATV techniques would benefit the public" and that "the benefits of this technology can be realized by the public most quickly if existing broadcasters are permitted to implement ATV." It also quite correctly finds "that existing service to viewers utilizing NTSC receivers must be continued irrespective of the actual manner in which ATV services are delivered, at least during a transition period."** Embrace of these principles lays a clear foundation on which to build the regulatory framework for a terrestrial broadcast ATV service.

These findings also send the message that the Commission is determined to assure that viewers of the free over-the-air local broadcast service benefit from advances in the technical quality of television images that will soon be available

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* Further Notice, ¶113.

** Id., ¶4.

in competing pay media. Thus, CBS welcomes the Further Notice and, in the remainder of these Comments, will discuss the technical, policy and legal questions raised in the Further Notice related to the issues of spectrum allocation, technical standards, and allotment methods.

II. SPECTRUM ALLOCATION ISSUES

The Commission "tentatively conclude[s] that any spectrum capacity needed for broadcast ATV system[s] will be obtained from the spectrum now allocated to broadcast television" and that "systems requiring more than 6 MHz to broadcast a noncompatible signal, such as the MUSE 9 MHz system, will not be authorized for terrestrial broadcast service."*

The preliminary data on spectrum availability and the spectrum-efficiency claims of some system proponents provide hope that existing VHF/UHF spectrum will be sufficient for ATV terrestrial broadcasting. However, the data we have is preliminary, further spectrum analysis is being undertaken by the Advisory Committee, and the claims of system proponents are yet to be verified. Importantly, even these preliminary data indicate that there is insufficient VHF/UHF spectrum in the nation's largest television markets to accommodate certain

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* Further Notice, ¶4.

proposed ATV systems. In the meantime, therefore, an unbreakable commitment to the VHF/UHF bands as the only supplementary spectrum for terrestrial broadcast ATV transmissions is premature.

A. Spectrum Allocation Decisions Should Be Made When Spectrum Requirements Of A Competitive Terrestrial Broadcast HDTV System Are Known.

An essential goal of the Commission should continue to be to enable each television station to broadcast a true HDTV signal throughout its service area. As the Commission states in its initial NOI, "it would appear to be desirable to consider options which give all television licensees an opportunity to provide improved service."*

Although the general tenor of the Further Notice remains consistent with this goal, the Commission, at one point, now states:

> "While we desire to authorize ATV service in a manner that would provide opportunity for all existing television stations to participate, based on the findings of the Advisory Committee and OET studies, we are not optimistic that this can be achieved easily. Nevertheless, we have tentatively decided to allot supplemental spectrum only within the existing VHF and UHF television allocation to provide for possible ATV transmissions."**

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* NOI, ¶3.

** Further Notice, ¶75.

CBS agrees that the goal of universal terrestrial broadcast ATV service cannot "be achieved easily," but this does not lead to the conclusion that spectrum options should be narrowed. Rather, it compels the conclusion that all spectrum options should be considered unless technically unsuitable or rendered unavailable by overriding policy considerations.*

More specifically, it is simply too soon to foreclose consideration of 1-13 GHz spectrum for terrestrial broadcast ATV given the significant further analysis planned under the aegis of Working Party 3 (Spectrum Utilization and Alternatives) of the Advisory Committee's Planning Subcommittee and Working Party 2 of the Systems Subcommittee (System Evaluation and Testing). As the Advisory Committee's Interim Report states, "[w]ithout question, more detailed spectrum analysis...is required"; and if untested assumptions as to interference, power requirements and channel separation do prove not to be valid, "additional spectrum capacity outside of the existing television allocations may have to be considered."** While CBS applauds the Commission's desire to move forward expeditiously in its decision-making process, the Commission should not repudiate this central finding of its own

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* The Commission drew the right conclusion in connection with the UHF Freeze and the deferral of private land mobile sharing. That is, only when the Commission has "conclude[d] [its] technical analyses and develop[ed] a variety of channel allotment plans" would it "be in a position to relax or repeal the television freeze and to assess the public interest utility of the PLMRS sharing proposal." Further Notice, ¶96.

** Interim Report, p. 8.

Advisory Committee by foreclosing spectrum alternatives prematurely.

1. The Quality/Spectrum Cost Trade-offs Are Well Presented In The Commission's Four Tentative Spectrum Allocations Options.

The Further Notice lists four options for ATV spectrum assignments:

- no additional spectrum allotment, resting on the hope that a competitive-quality NTSC-compatible 6 MHz ATV system can be developed;

- 3 MHz of additional spectrum, not necessarily contiguous to the main 6 MHz channel, for augmentation of existing NTSC signals;

- 6 MHz of additional spectrum, not necessarily contiguous to the main 6 MHz channel, for augmentation of existing NTSC signals;

- 6 MHz of additional spectrum, not necessarily contiguous to the main channel, for simulcasting of a non-compatible ATV signal in addition to the NTSC transmission on the main channel.

The Commission describes these as the "four basic options within the range of [the] tentative decision on spectrum" and seeks comments on "service quality, equipment costs and other economic impact elements, and implications for spectrum efficiency."*

CBS generally agrees with the Commission's discussion of the quality/spectrum cost trade-offs of the various options.** That is, the single-channel NTSC-compatible 6 MHz option

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* Further Notice, ¶83.

** Id., ¶¶84-90.

would be the most spectrum efficient, but would also be the least likely to accommodate an ATV system of competitive technical quality. On the other hand, the 6 MHz simulcasting option avoids NTSC artifacts and thus is more likely to be of competitive quality but is less spectrum-efficient during the transition period when both NTSC and ATV service would be needed. Finally, if viable, the augmentation options might offer true HDTV quality, but at the cost of long-run spectrum inefficiency.

CBS believes that this framework is a useful way of presenting the quality/spectrum cost trade-offs that would be involved in implementing ATV systems of varying spectrum requirements. Further, it will serve to focus the attention of the Advisory Committee, the testing groups and system proponents on these trade-offs and on the Commission's predisposition to implement a terrestrial ATV system using only VHF/UHF spectrum. However, until propagation tests are conducted and working transmission systems are evaluated in real-world environments, there is simply no way to answer the critical questions of how much augmentation or free-standing spectrum is required to transmit a competitive quality ATV signal.

Until such questions are answered, final decisions on spectrum allocation should not be made. With that in mind, it may be

useful to note briefly the different challenges and constraints posed by each of the four spectrum allocation options tentatively proposed by the Commission.

a. The No-Additional-Spectrum Option

In order to provide ATV within existing 6 MHz channels, the additional information required to extend signal performance to the ATV level must be multiplexed with the current NTSC signal without degrading the performance of current NTSC receivers and without signal deterioration when passed through cable. A wide variety of techniques are possible: frequency multiplexing in unused portions of the 6 MHz channel; time division multiplexing in the vertical and horizontal blanking intervals; reducing picture size to free up lines for additional information; and adding additional carriers. Another technique is temporal subsampling of an ATV signal to make it appear as an NTSC signal to NTSC receivers.

All of these techniques have certain problematic features -- they degrade the "compatible" NTSC picture to some degree and they adversely affect the "robustness" of the cable-retransmitted signal. In general, the more information added to the NTSC signal, the more degraded the picture quality of the compatible NTSC signal. Thus, the design of single-

channel 6 MHz ATV systems is an exercise in trade-offs between picture quality on ATV receivers and picture quality on NTSC receivers -- the greater the ATV picture quality, the lesser the NTSC picture quality, and vice versa.

ATV receivers can, and presumably will, be designed to have greater immunity to interference from other ATV signals and from existing NTSC signals than current NTSC receivers. However, it will be a challenge to design a 6 MHz single-channel NTSC/ATV system with sufficient robustness to perform adequately on existing NTSC receivers (and through cable), given the currently allowed level of interference from other NTSC signals, other ATV signals, and other sources such as mobile radio. This is so because the added information multiplexed into the NTSC-based ATV signal will undoubtedly be on frequencies where the normal NTSC signal carries little information, and this "breathing room" in the normal NTSC signal contributes to the effectiveness of precision offsetting of the visual carriers in reducing interference. Also, decoding of an NTSC/ATV multiplexed signal will likely require greater precision than is required to decode the normal NTSC signal. Whether these challenges can be met cannot be determined until the proposed systems are built and tested.

b. The 3 MHz Augmentation Option

The Commission's second stated option is to assign licensees an additional 3 MHz for use as an augmentation channel to provide additional information to increase the NTSC signal quality to an ATV level. Again, the NTSC signal would remain. However, with the extra bandwidth, the amount of additional information that must be multiplexed into the base NTSC signal is reduced, easing the problem of NTSC picture degradation.

This option introduces a new set of challenges. Unless the additional 3 MHz is contiguous with the current NTSC channel, it will be difficult to produce a signal which can overcome variations resulting from differences in the propagation characteristics between the main and augmentation channels. Such a system may also be particularly sensitive to reflections or to degradation when integrated at cable headends or retransmitted to subscribers through coaxial cable. Finally, the additional bandwidth will come from channels that are currently vacant because of interference criteria such as the UHF taboos, and it is unknown whether the augmentation channel can be configured so that interference will not be a problem. Again, these question can only be answered after propagation and system testing.

c. The 6 MHz Augmentation Option

The third option -- to provide 6 MHz for an augmentation channel -- allows greater bandwidth and thus tends to ease the problem of designing an ATV system of sufficient technical quality, but increases the difficulty of finding sufficient VHF/UHF spectrum for all existing licensees. Also, where the channels are noncontiguous, the effect of the difference in propagation characteristics between the main and augmentation channels might be even more troublesome with a 6 MHz augmentation channel than with a 3 MHz channel, because the augmentation channel would be carrying more information in this scenario. Finally, as with the 3 MHz augmentation option, it is unclear whether the augmentation signal can be designed to meet the requirements for interference into NTSC receivers.

d. The 6 MHz Simulcasting Option

Under this option, an additional 6 MHz channel would be assigned to licensees for use as an independent ATV signal while the licensee continues its NTSC service over its original channel. Thus, simulcasting would assure maintenance of service to NTSC receivers during transition to ATV.

MIT, Zenith, NHK and others have emphasized in their proposals that, because of the inefficiencies of the NTSC signal, a better quality ATV picture can be achieved in a given amount of spectrum if ATV/NTSC signal multiplexing or augmentation is not required.* That is, this option affords the opportunity for the ATV system designer to take full advantage of modern compression techniques and to avoid the artifacts of the NTSC system. Also, this option has the advantage that ATV spectrum need not be contiguous with the licensee's NTSC channel.

As with all other options, however, questions about the robustness of each such system in the terrestrial broadcast and cable environment, or about the nature and extent of interference to and from NTSC transmissions, cannot yet be answered. Although the reports of expected performance of the 6 MHz non-compatible simulcasting approaches are encouraging, final judgment must await the results of system testing.

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* There is general agreement that the NTSC system is an inefficient and outdated multiplexing and modulation system. However, since it is necessary to maintain compatibility of an ATV signal with the current NTSC receiver population, little can be done to improve the efficiency of an ATV/NTSC multiplexed or augmented signal, since such a signal will have to be derived from the NTSC signal. For example, digital sound could be implemented in an ATV system during the vertical or horizontal blanking intervals, releasing .5 MHz for additional video information. However, this efficiency could not be implemented in an ATV/NTSC multiplexed signal, since current NTSC receivers could not accommodate it.

2. The ATTC Testing Program Will Provide Information That Is Indispensable To Ultimate Spectrum Allocations Decisions.

Stimulated by the original NOI and by the establishment of the Advisory Committee, an extensive effort is being made in the private sector to plan for the introduction of a terrestrial broadcast ATV system. Of particular importance is the creation of the Advanced Television Test Center ("ATTC") by a coalition of broadcasting companies and industry organizations, including the National Association of Broadcasters, the Association of Maximum Service Telecasters, Capital Cities/ABC, Inc., CBS, National Broadcasting Company, Inc., the Association of Independent Television Stations and the Public Broadcasting Service. This testing facility is jointly funded by its founding members and is intended to support the work of the ATSC and the FCC Advisory Committee Subcommittees. The data and test results developed by the ATTC will be provided to the ATSC and to the Advisory Committee.*

A high priority for the ATTC is the continuation of the propagation tests begun by the Advanced Television Systems Committee ("ATSC") and planned jointly by the ATSC and the

* In addition, the ATTC is working with Cable Labs to evaluate the impact of cable retransmission on the integrity of terrestrial broadcast ATV transmissions.

Advisory Committee. These tests are scheduled to be completed in six to eight months. Some of the critical issues that will be addressed include:

- the feasibility of wide separation in frequency between the main NTSC channel and an augmentation channel;
- the effect of reflections on wide-band systems in the UHF band;
- the propagation characteristics of the 1-13 GHz region, which will provide needed data on the question of the feasibility of terrestrial broadcasting in this frequency band.

With regard to system testing, the Advisory Committee's Planning and Systems Subcommittees have laid the groundwork for an extensive test program to be performed on proposed ATV systems. The program will determine the comparative objective and subjective performance of such systems both in an ideal environment (with no interference) and in a real-world propagation environment. That propagation environment will be based on the results of the propagation testing program now underway. A simulator will be developed to permit realistic testing of propagation effects as well as interference